

ENVIRONMENTAL PUBLIC HEALTH TRACKING:

Developmental Disabilities in Children and Exposure to PCBs

Massachusetts Department of Public Health
Center for Environmental Health
Environmental Toxicology Program

Adverse Reproductive Outcome-Related Projects

- Targeted Surveillance of Birth Defects and Exposure to Disinfection By-Products
 - Track selected birth defects in children and link to disinfection by-product (DBP) data statewide in order to determine possible unusual patterns that may warrant analytical study (EPHT supplemental activity)
- Developmental Disabilities in Children and Exposure to PCBs

Project Goal

- Track developmental disabilities in children and link to polychlorinated biphenyl (PCB) contaminant data in Berkshire County in order to determine possible unusual patterns that may warrant analytical study

Developmental Disabilities and PCBs

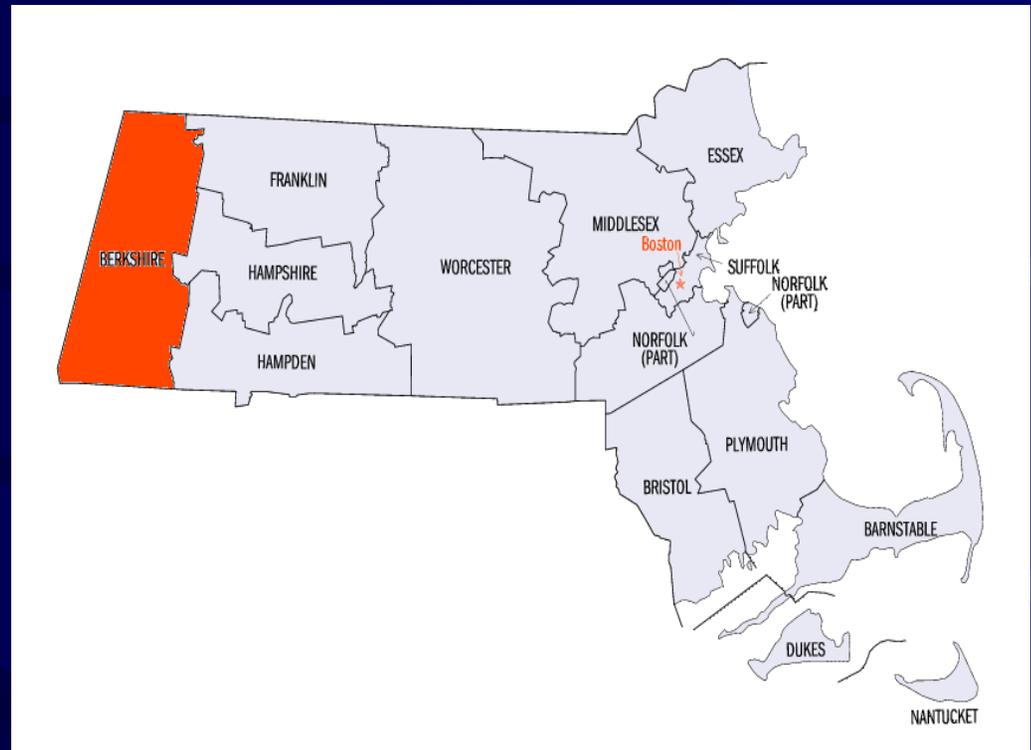
- Strong evidence suggests that the interaction of genetic, toxicologic, and social factors is responsible for the development of developmental disabilities such as cognitive and behavior deficits
- PCB exposure has been found to affect neurodevelopment in infancy and childhood
- Prenatal PCB exposure at background levels has been associated with deficits in cognitive functioning

PCBs and Thyroid Hormones

- Thyroid hormones regulate the development of the fetal brain
 - Irreversible brain damage can be caused by a thyroid hormone deficiency during fetal life or during the first few years after birth
- Increased PCB exposure has been associated with decreased triiodothyronine (T3) levels in pregnant mothers and decreased thyroxine (T4) levels in children

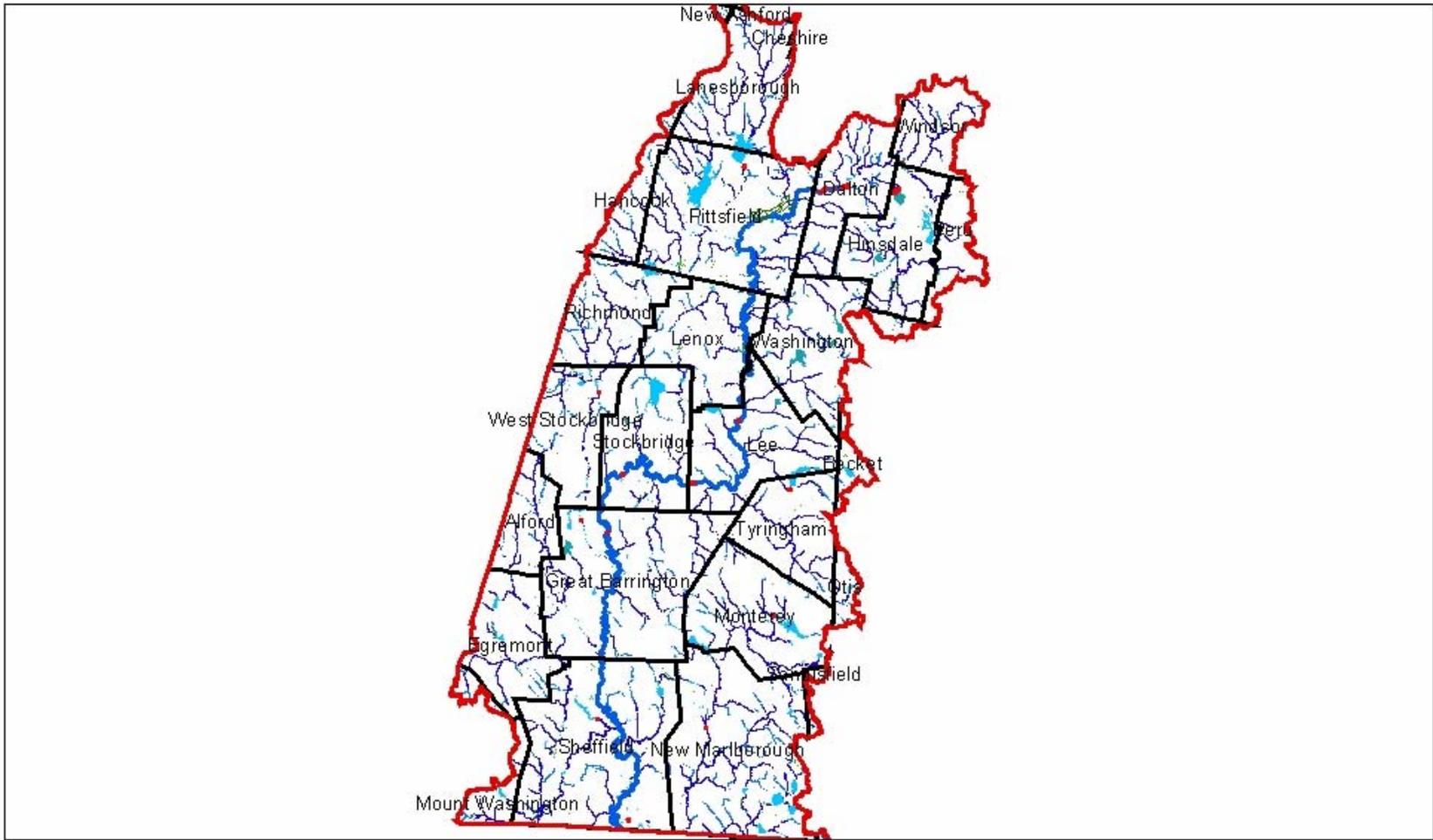
Proposed Population To Be Tracked

- The proposed population to be tracked will consist of children ≤ 10 years of age residing in Berkshire County, located in western Massachusetts, who have one or more developmental disabilities



Proposed Population To Be Tracked (cont'd)

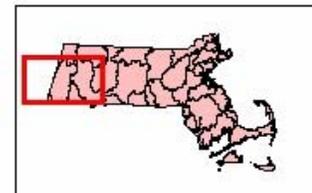
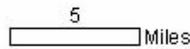
- Population chosen because of historical concerns about PCB contamination in water, air, soil, fish, and wildlife
 - PCBs were first discovered in sediment and fish from the Housatonic River in the 1970s

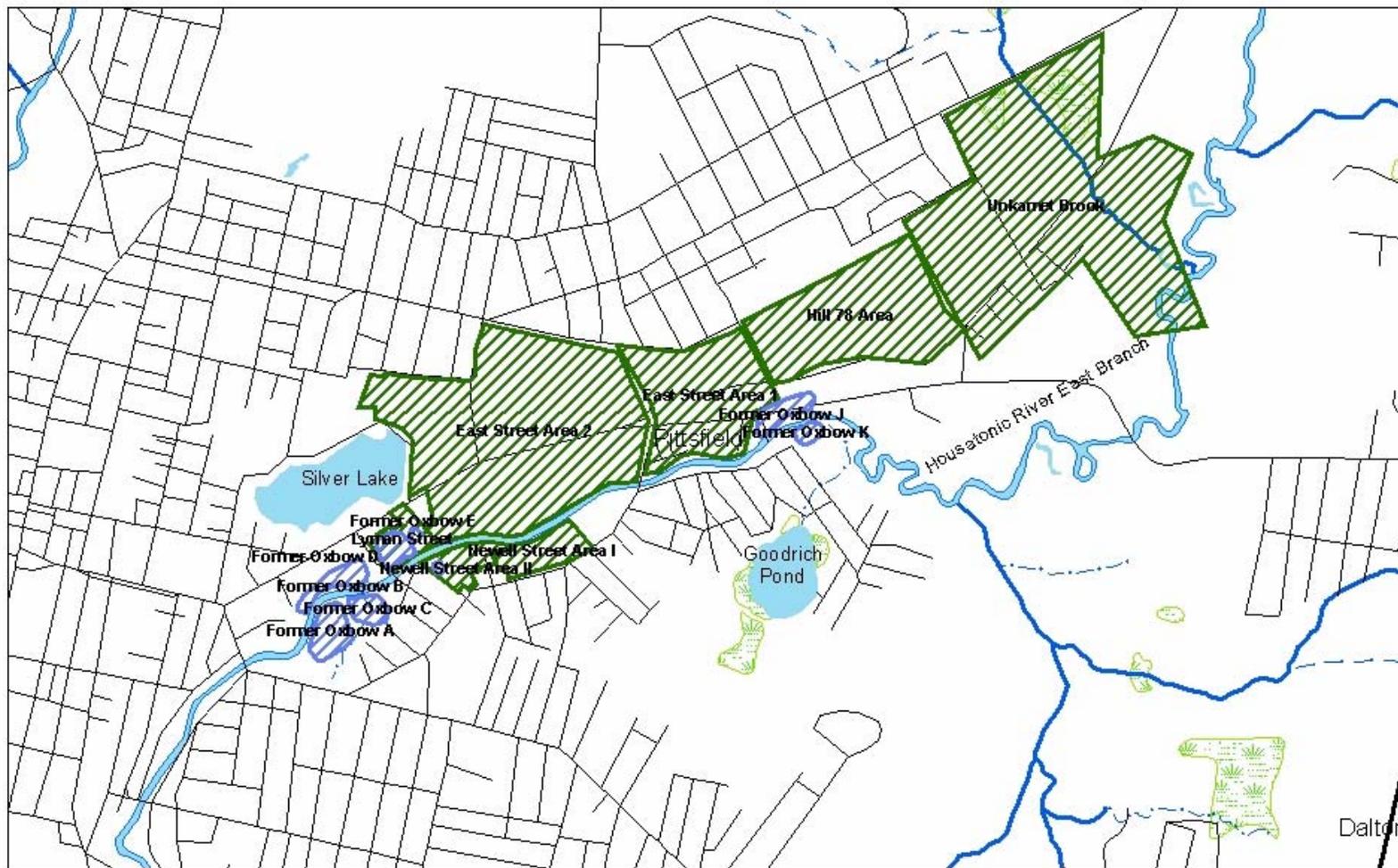


Legend

-  Housatonic River Watershed
-  Housatonic Watershed Towns
-  Former Oxbows
-  GE Sites
-  Housatonic Watershed Dams
-  H_River_Fish_Advisory_Extent
-  Public Surface Water Supply
-  Lake, Pond
-  River
-  Wetlands
-  Stream
-  Intermittent Stream

Housatonic River Watershed

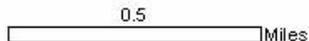




Legend

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ■ Massachusetts_Towns — Berkshire_County_Streets ■ GE Sites ■ Former Oxbows Rivers/Streams — River/Stream — Intermittent Stream | <ul style="list-style-type: none"> Water Bodies ○ Flat ■ Wetland ■ River ■ Lake/Pond |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|

General Electric Sites, Pittsfield, MA



Sources of Data: Children 0 to 3 Years of Age

- Early Intervention Program
 - Serves eligible children suspected of having a developmental delay or a condition that could result in delay
 - Information available:
 - Developmental disabilities
 - Level of severity
 - ICD-9 Code & Description

Early Intervention Data

- Benefits

- Data from 1998 to present in central database
- Information about numerous variables collected (1998 to present)

- Limitations

- Data from 1987 to 1997 on mainframe
- Amount of information collected varies prior to 1997

Sources of Data: Children 3 to 10 Years of Age

- Department of Education Individual Education Programs (IEPs)
 - Implementation due to Individuals with Disabilities Education Act Amendments of 1997
 - required the early identification and intervention of developmental disabilities through the use of community-based programs

Department of Education Data

- Benefits

- Recent data entered into central database
- Special Education Elements broken down into 13 categories

- Limitations

- Limited amount of information collected
 - Address not collected

Proposed Case Definition: Children 0 to 3 Years of Age

- ICD-9 Descriptions
 - Floppy Infant Syndrome/Hypotonia
 - Global developmental delays
 - Mild to severe hearing impairment
 - Hypothyroidism
 - Autism
 - Attention Deficit Hyperactivity Disorder
- Developmental Delay in one of the following domains:
 - Gross motor*
 - Fine motor*
 - Expressive language
 - Receptive language
 - Cognitive*
 - Social/emotional
 - Adaptive/self-help*

Proposed Case Definition: Children 3 to 10 Years of Age

- Intellectual Impairment*
- Sensory/Hearing Impairment
- Communication Impairment
- Sensory/Vision Impairment
- Neurological Impairment*
- Health Impairment*
- Emotional Impairment*
- Physical Impairment
- Specific Learning Disability*
- Multiple Disabilities*
- Deaf/Blind
- Developmental Delay*
- Autism

Proposed Years of Data Collection

Berkshire County

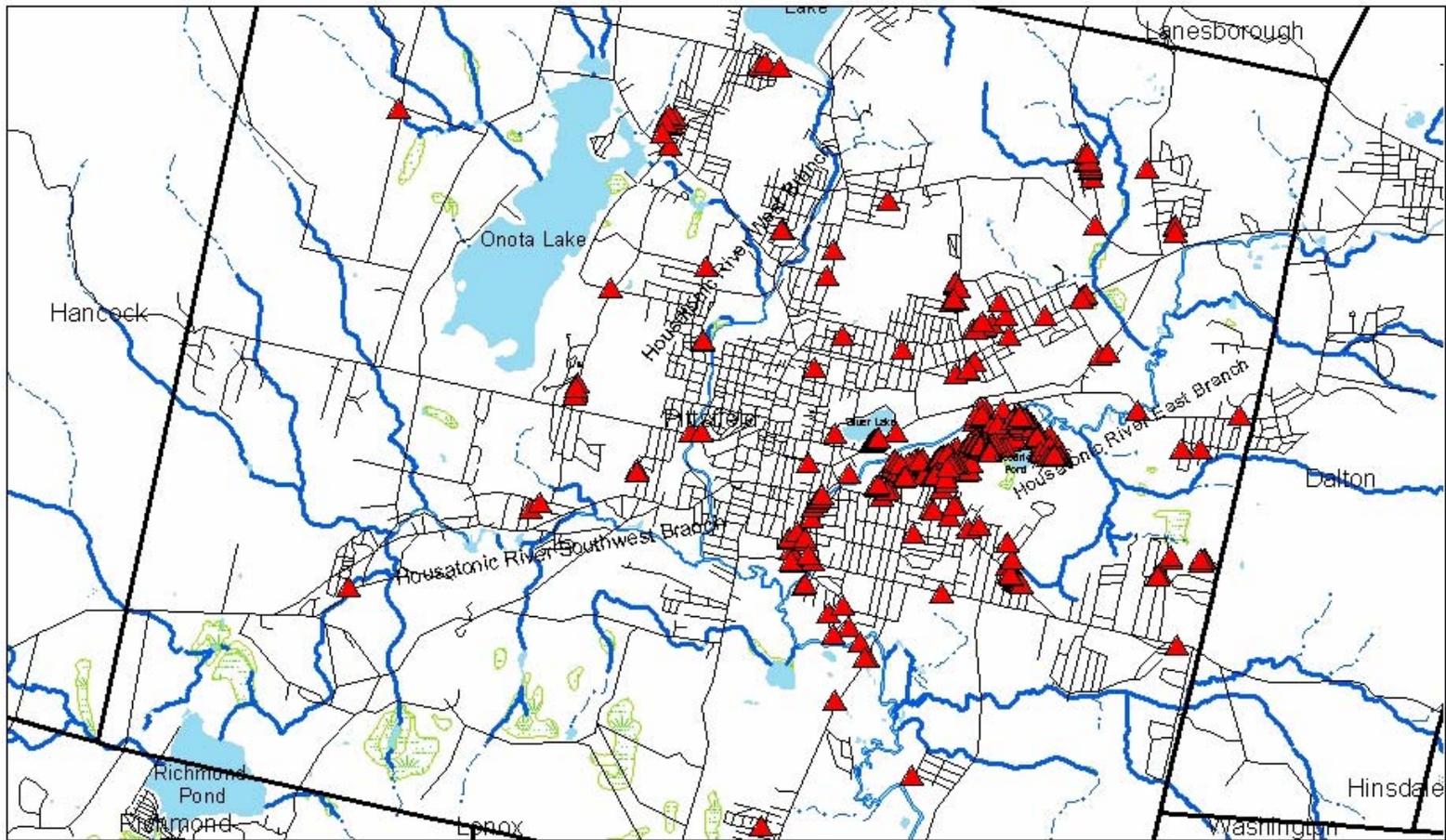
- EI data: ≥ 1998
- DOE data: ≥ 2003

Linkage

- Developmental disability data will be linked with environmental (PCB) data from across Berkshire County
 - 536 properties have already been geocoded and GE sites have been mapped
 - Encompasses approximately 20,000 surface and 20,000 subsurface soil sampling points
 - Several layers have been developed for linkage

PCB Environmental Data

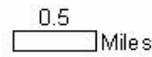
- Soil Sample Data
 - Collected 1992 to present
 - Approximately 300 households sampled
 - Surface and Subsurface Data
 - Minimum & Maximum
 - Mean & Median
- Air Sample Data
 - Collected 1991-1992 & 1995-1996



Legend

- Massachusetts_Towns
- Residential Properties Tested for PCBs
- Berkshire_County_Streets
- Rivers/Streams**
- River/Stream
- Intermittent Stream
- Water Bodies**
- Flat
- Wetland
- River
- Lake/Pond

Residential Properties Tested for PCBs in Pittsfield, MA



Objectives Accomplished

- Extensive literature review performed
- Scientific protocol draft written
- Held meetings with EI and DOE -
discussed availability of and access to
data
- Protocol draft sent to CDC

Next Steps

- Finalize protocol
- Finalize confidentiality/user agreements with DOE
- Determine number of children (≤ 10 years old) with developmental disabilities and geocode health data
- Finish geo-coding PCB environmental data

Next Steps (cont'd)

- Link developmental disabilities data with PCB exposure data
- Identify potential public health follow-up activities